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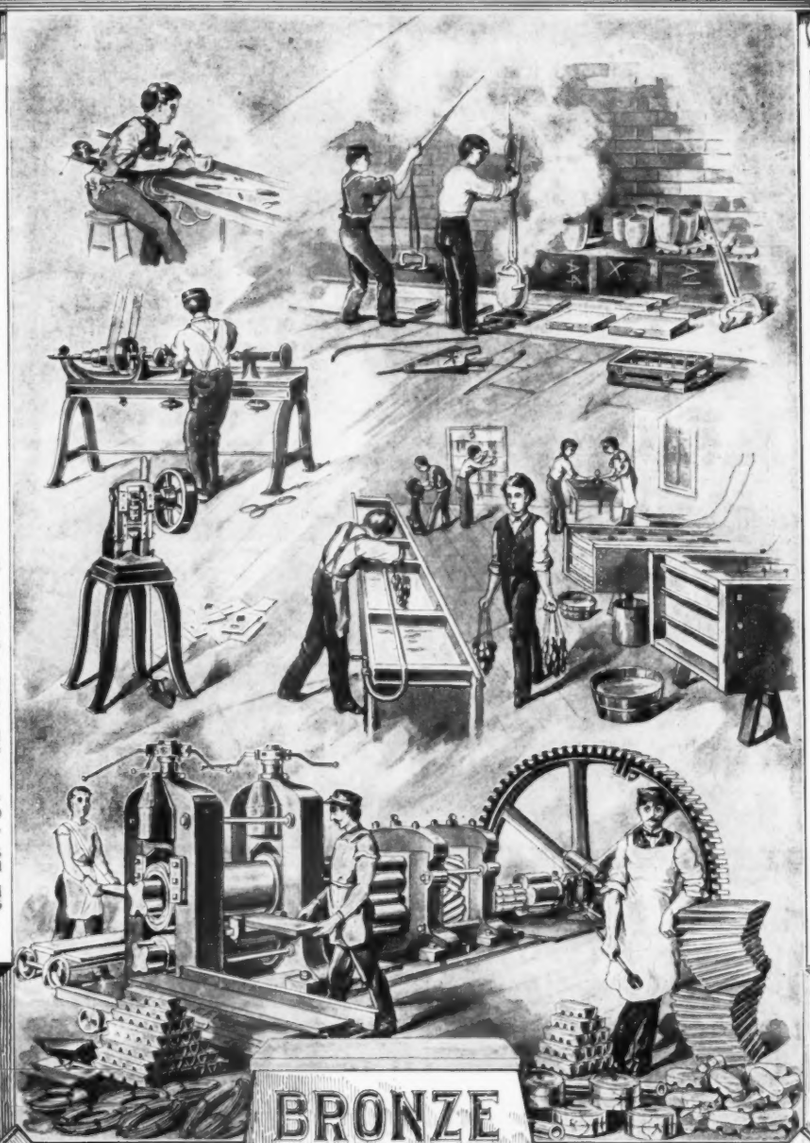

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OLD SERIES Vol. X, No. 9. Vol. II, No. 9. NEW SERIES

LABOR OMNIA VINCIT

SEPTEMBER, 1904

NEW YORK.

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AND
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AND
THE BRASS FOUNDER AND FINISHER
AND
ELECTRO PLATERS REVIEW

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CADMIUM IN SPELTER.

Considerable discussion is now taking place in regard to the effect of cadmium, which is contained in certain varieties of spelter, on brass. It is assumed that, inasmuch as it is an impurity in the spelter, it has a deleterious influence on brass, and spelter to be suitable for the manufacture of brass sheet must be free from cadmium. We have in mind a mill superintendent who was having much trouble with his brass, and every resource was exhausted to find the reason. No abnormal conditions were found except in the results of the analysis of the spelter which was used in making the brass. In this metal was found 0.003 per cent. of cadmium, and with the cry of "Eureka!" orders were at once issued that all spelter should be analyzed and only those brands which were free from cadmium should be used. The cadmium was assumed to have caused the difficulty because the trouble had to be laid to something. History fails to record the rest and to tell whether the trouble ceased, but we believe it did not. Nevertheless, cadmium was assumed to be an injurious element in spelter.

We may say in connection with the presence of cadmium in spelter that it was our good fortune at one time to conduct a series of experiments on the influence of cadmium on the rolling properties of brass, and amounts of pure cadmium were added to brass in quantities up to 0.50 per cent. without showing that it had any deleterious effect beyond a slight hardening. While the experiments were not exhaustive nor extensive, they were of such a nature to indicate that cadmium in the amounts which exist in commercial spelters has no direct effect on the rolling properties of brass.

As far as the influence of cadmium on the casting qualities of brass is concerned, we are of the firm opinion that, rather than having a bad influence, it may have a good one. Cadmium has a strong affinity for oxygen, and so acts as a deoxidizer. In fact, it has become standard practice to add cadmium to sterling silver for this very purpose. In some respects cadmium is like zinc, particularly in its property of volatilizing when heated and the burning of the metal in the air. In others, such as color or malleability, it resembles tin, and may be rolled out into sheet as readily. From analogy one would scarcely expect a metal having properties so nearly like zinc to have any great influence in the properties of brass, espe-

cially in the amounts which exist in commercial spelters.

GUN-METAL.

Much inaccuracy exists in regard to the term "Gun-metal." Originally intended to apply only to material used in the manufacture of guns it has, by common usage, become more or less corrupted so that the term is now applied to many varieties of metals and alloys.

During the civil war all the large guns were made of cast iron and only the very best charcoal iron entered into their manufacture. This variety of cast iron, which possesses a much higher tensile strength than ordinary cast iron, was then known, and is now, by the name of gun-metal. The march of improvement having been felt in the manufacture of large guns, cast iron has been replaced by steel and the latter is again known as gun-metal.

In early times and, indeed, almost within the memory of the oldest inhabitant bronze guns were used by the various nations, and large numbers of these are now intact and nearly every one is thoroughly familiar with them. This material is the really true gun-metal and deserves the name in preference to iron or steel, for it antedated these materials by many centuries. The metal or alloy which entered these early guns was invariably copper and tin alloy with or without a small amount of zinc. When gun-metal is mentioned in non-ferrous metallurgy it should mean this alloy and in the proportions which are suitable for a large gun and not simply apply to any mean which is red in color.

The specifications of our Government call for gun-metal which consists of 88 parts of copper, 10 parts of tin and 2 parts of zinc. This alloy is commonly known as 88-10-2 mixture. It is an excellent alloy for purposes requiring strength. When more ductility is required the amount of tin is reduced to 8 per cent. We advocate that this composition, with or without zinc, should be called gun-metal (zinc is added to prevent porosity, although, if sound castings can be obtained the copper and tin alloy is stronger) and that the term should not apply to alloys of the nature of composition and which contain some 10 per cent. or more of zinc and only a few per cent. of tin. We notice a tendency among makers of metal wares to call all red metals gun-metal without any discrimination in regard to the amount of tin which the alloy contains. The practice is hardly laudable, but appears to be growing. The consumer believes that he is obtaining a strong alloy when, in reality, a weak one is forced upon him.

BRAZING CAST IRON.

Cast iron has always been a difficult material to solder or braze and early attempts invariably resulted in failure. There are many instances, notably broken gear teeth or similar materials, upon which the brazing process can be quite advantageously employed, and we are pleased to say that the problem of brazing cast iron has finally been solved. We have recently seen many examples of brazed cast iron and had the pleasure of personally testing them. The results were very gratifying, so much so that we are free to confess that cast iron brazed after the proper method is a reliable article. In every instance in which the cast iron was brazed blows from a hammer failed to break the casting in the brazed joint, but the fracture occurred outside of it. The quality of the cast iron does not seem to affect the brazing process, but all kinds braze equally as well.

The principle of this modern brazing process consists in the principle of burning out the carbon and silicon on the surface. These elements are always present in cast iron, otherwise it would not be cast iron, and prevent the union of the brazing solder with the metal. By the application of a mixture of oxide of copper and borax as a flux in the brazing, the carbon and silicon are burned away with the reduction of the oxide of copper to metallic copper which immediately unites with the metal. Of course, the usual brazing solder is employed, but it is to the burning away of the carbon and silicon that the success of the process is due. We believe that there is much in store for this process, as there are many cast iron parts of machines or appliances which may be readily brazed together when broken, and not only the expense of a new casting saved, but, what is usually far more necessary, the great saving in time.

THE BRITISH GERMAN SILVER INDUSTRY THREATENED.

News has just reached us in the form of the rather paradoxical statement that the Germans are usurping the German silver industry of Great Britain. The competition of Germans in all lines of goods, of course, has been keenly felt, but the invasion of the German silver trade by the Germans is, apparently, quite recent. It was supposed that such a condition could not be possible in the face of the often believed statement that the German silver industry has arrived at a state near perfection.

In spite of the fact that no German silver maker will admit that his metal will not do everything that is possible to do in the metal working line, there are instances in which the best of the makers fall short of the supposed perfection. What is desired in a German silver is softness, color and freedom from corrosion; and those makers who can metal which will stand the spinning, drawing or buffing without showing flaws, and have the proper color, can compete with any known German silver producer. Many of the makers fall short of the spinning test, the most difficult of all, and, for this reason, are unable to supply metal which will answer this requirement.

The trouble in England is caused by a German maker putting upon the market, in Sheffield and Birmingham among the flat-ware makers, a German silver which, it is said, spins and draws more easily than the common grades of English German silver. The color is superior and the price about the same as the domestic article. From present reports the German silver makers in England seem to be anxious. All this seems interesting to us for the reason that the case is almost parallel in the United States. It is certain that there is yet much to be learned about German silver.

THE CRUCIBLE FURNACE IN GERMANY.

By C. Irresberger, Engineer.*

No branch of the metal industry exhibits so great a diversity as that which employs the crucible furnace. The cause lies in the comparative newness of the establishments able to provide the furnaces. Ten years ago we could have counted on our fingers establishments

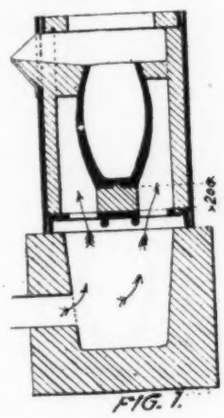


FIG. 1.

possessing this type of furnace, while to-day the majority are equipped with such an appliance. Beyond all others the foundries of large machine shops can now scarcely do without a crucible furnace. They are most extensively used for melting yellow and red brass, phosphor-bronze and alloys of all kinds. They are used for making gray iron, valves, cylinders, rings and packing and other material of this kind, while crucible furnaces for making steel and malleable iron castings have lately been introduced. Crucible furnaces working with gas can hardly be called a foundry appliance, on account of the cost of working, and are very little used for this purpose.

The Piat-Bauman Furnace.—Crucible furnaces of the old type, where the crucible is surrounded with coke, and the draught produced by a chimney, are still used, but are gradually being forced out by the furnaces with artificial blast. The advantage of the latter is readily seen. The old type of crucible furnace, working under good conditions, and melting, say, 100 lbs. of bronze composed of 54 lbs. of ingot copper, 3.2 lbs. of tin, 3.3 lbs. of zinc, 37.0 lbs. of scrap containing 88 per cent. of copper, and 2.5 lbs. of phosphor-copper containing 10

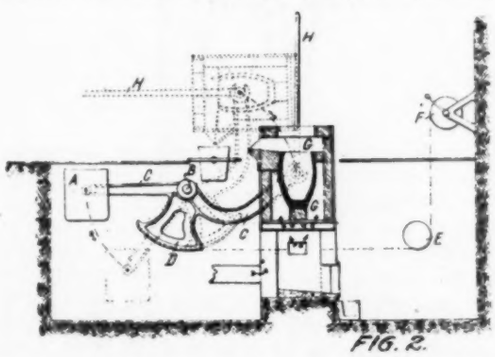


FIG. 2.

per cent. of phosphorus requires about 50 or 60 lbs. of coke, to 100 lbs. of metal, and also take about 1½ hours to melt a crucible charge of 200 lbs. The best graphite crucible to be obtained only lasts 25 heats (No. 70) in the old type of crucible furnace. In the Piat-Bauman furnace, 375 lbs. of metal may be melted in from 12 to 18 minutes, with a coke consumption of 70 lbs., and with a crucible life (No. 150) of 40 heats, which may be increased to 60 with a proper protecting coating. The loss in melting in the old type of crucible furnace amounts on red bronze to about 0.3 per cent. This may be kept still lower in the Piat-Bauman furnace, and in no case exceeds it. In the old type of crucible furnace, where the crucible is lifted out by means of tongs, the life is very much shorter than otherwise, on account of the injury which the tongs produce. The use of crucible of more than 200 lbs. capacity, as likewise difficult on account of the impracticability of removing the crucible from the fire. The great weight of metal on the bottom renders the operation somewhat dangerous. In the Piat-Bauman furnace this is obviated.

A furnace of the Piat-Bauman type, in order to obtain the best results, should have space enough between the crucible and the sides to admit of coke enough being packed around to melt the entire charge. If coke has to be put on during the melt, the heat is prolonged. The coke should not be either too small or too large. Large pieces do not settle well, and small masses prevent the blast from coming in contact with all the fuel.

Furnace makers have given much attention to the introduction of the blast in the tilting crucible furnaces of the Piat-Bauman type. In this particular furnace the furnace itself stands on a mason-work box (Fig. 1), and the blast is driven upward and comes in contact with all the grate bars. Uniform combustion is thus secured. If good coke is used the grate need only be cleansed every four or five heats. In this arrangement the air which is used for blast must penetrate quite a layer of coke before it comes in contact with the crucible, and as it has parted with some of its oxygen, the life of the crucible is thereby prolonged. Bauman has lately given to his furnace a double or triple blast introduction, and this has resulted in serious inconvenience, as the lining of the furnace burns out locally. Bauman states, however, that such a change was made in order to obtain a higher temperature for the melting of iron or steel. For brass melting it is not to be recommended, but the first method gives the best results.

The Piat-Bauman furnace consist essentially of a shell in which the crucible is placed as in the ordinary crucible furnace. In order to pour the metal, however, the whole furnace is tilted and the crucible is not removed at all. The injury done to the crucible by such tools is not manifested, and a much longer life insured. The great changes in temperature produced by the removal of the crucible does not take place in this furnace as the crucible constantly maintains its initial heat. The invention of this furnace indisputably belongs to Piat, but there are now similar furnaces being put in the market in the United States.

The older arrangement of the Piat exhibits some faults. The furnace was attached to the lever C (Fig. 2) which turned on the axis B. The weight was offset by the counterpoise A. To empty the furnace it must be raised by the windlass F and the chain running on the curve 4 of the lever C. Then only by means of the hand lever H could the furnace be tilted and emptied. When raised sufficiently a swinging motion was given to it for pouring and this required two men besides the men at the ladles. The ladles could not be set down, as they had to be moved so as to correspond

*Translated from *Stahl und Eisen*, February, 1904, by F. C. Stanley.

to the motion of the pouring lip. These faults are set aside in the new arrangement of Bauman (Fig. 3). The raising and swinging is united into one movement, the ladle may be set down during the filling, as the lip of the crucible lies in the axis, and remains constantly at the same point. The pouring is done by the man who operates the hand wheel E, and in so doing has a good view of the metal as it flows out, and, therefore, regulates it with greater comfort and safety. The handling of the device may be illustrated in Fig. 3 without any further explanation.

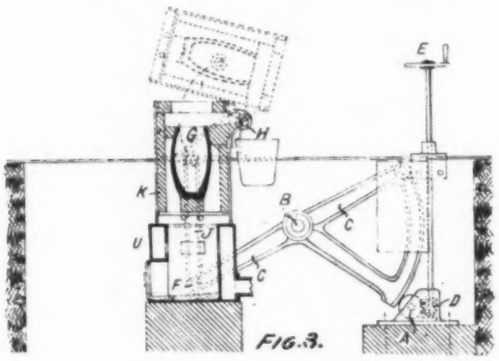


FIG. 3.

The accessibility of the grate and facility for cleaning are points which are not brought out in all furnaces of the Piat type with equal perfection. In the Piat-Bauman furnace the grate is arranged so that it may be readily cleaned, and, indeed, in cases of slag adhering to the bars, they may be easily cleaned in a few minutes. If a crucible breaks the metal in some of the types runs down into a space where it is quite difficult to remove. Bauman in his latest furnace gives considerable attention to this point. The arrangement is shown in Fig. 4. The bot-

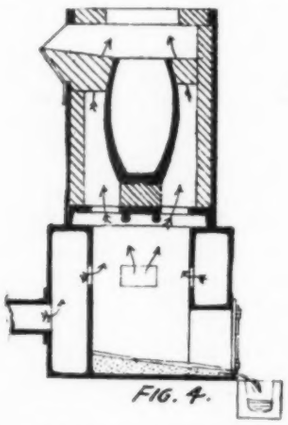


FIG. 4.

tom of the pit is filled with sand, rammed on an incline. The discharging hole is covered with a sheet of lead, and from this is a spout which empties into a crucible. In this manner any metal which escapes from a broken crucible is readily caught and saved. The furnace of the Piat-Bauman type which I use has a mason-work bottom, but I have never had difficulty in removing the metal which leaks from a broken crucible. A crucible seldom breaks into pieces, but usually a small crack or pin hole will form and the metal escape from it in a small stream. This stream of metal will fall down through the coke, and drop on to the furnace base in a congealed condition, so that it may be removed in a cake. I have used this arrangement for several years, and have not experienced any difficulty in this respect. The cake of metal can always be removed through the door. In the arrangement of Bauman with the lead plate, I would say that I have never seen the metal melt the plate out, as it solidifies as soon as it drops on the bottom, and does not run out.

An improvement in these furnaces is the use of the funnel on top of the furnace, which utilizes part of the escaping heat. These funnels form an essential part of the Piat-Bauman furnace, and contribute quite materially

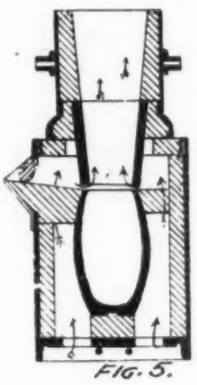


FIG. 5.

to the good results obtained. The funnel is essentially a fireproof cylinder, which fits over the top of the furnace, and through which all the gases and heat must pass before reaching the chimney. These funnels are made to correspond to the three principal meltings performed with this furnace, viz.: Yellow brass, bronze or scrap of both. In Fig. 5 is shown one the funnel used for yellow brass, or metals of similar fusibility. The furnace is first filled with coke, and brought to a bright yellow glow with a blast of ¾ in. of water pressure. The blast pipe for a furnace holding a No. 150 crucible, has a diameter of six inches. By this method one-quarter of the coke charge is burned, and the furnace must be refilled. Now the crucible is filled with the small pieces of metal, the funnel set above it, and the rest of the crucible

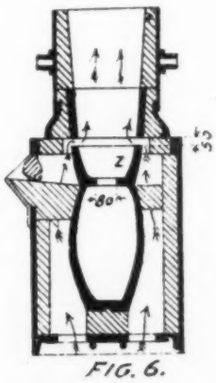


FIG. 6.

charge put into it. The blast is now increased to 5 inches of water. After three or four minutes the metal begins to melt, and at this point the blast must be reduced or the loss will be too great. The decrease in pressure should be at the rate of about ¼ in. per minute, and the melting will then be completed in about ten or twelve minutes. The coke consumption in such a case will not exceed 15 per cent. of the metal melted.

I have secured excellent results with an apparatus placed on the furnace, as shown in Fig. 6, which prevents too rapid a fall of metal. It may be said that the melting always begins in the cylinder and drops down

into the crucible. In the use of the apparatus shown in Fig. 6 the metal becomes fluid to a greater extent in the funnel, drops in the crucible and reaches the desired temperature. In the use of such a vessel the funnel is cut off even with the furnace shell and the melting is carried out in the following manner: The charge of coke is brought to a mild glow by a light blast, or merely the draught of the chimney. The vessel is then set upon the empty crucible and the funnel, which two men may easily lift off, is placed upon the furnace. In order to avoid having the small pieces of metal fall through, larger ones are laid on the bottom and the smaller one placed over them. No metal is put into the crucible itself, and the more difficult fusible metals, such as pig copper are placed on top. In the bottom of the crucible is put, for a No. 150 crucible, a charge of about ½ lb. of powdered glass. This glass forms an excellent covering for the metal, and as the melted metal falls into the crucible the glass floats on the top and protects it from further oxidation. During the first four or five minutes, the pressure is increased to 8 or 10 inches of water, and then, after about fifteen minutes, is shut off entirely. The melting is now finished, and the alloying may be carried out by raising the funnel and adding the tin, zinc, or phosphor copper, and after this is done we allow the whole to stand for five minutes more, and then very thin liquid may be poured out, with every assurance of good results.

The height of the blast is regulated by the amount of pig copper used. If an alloy is made of a total weight of 375 lbs., the capacity of a No. 150 crucible, and the amount of copper added is 100 lbs., 200 lbs. or 300 lbs., then the blast presuure is about as follows, viz.:

—100 lbs. copper—		—200 lbs. copper—		—300 lbs. copper—	
Minutes.	Pressure.	Minutes.	Pressure.	Minutes.	Pressure.
1—4	20	1—5	22	1—6	24
5—6	115	6—8	17	7—9	18
7—8	12	9—12	13	10—13	14
9—12	9	13—16	9	14—18	9

With red mixtures of lower copper content and more easily melted, during the melting a spurting of small drops of metal may occur. This fault which would greatly increase the loss may be avoided by accurate regulation of the blast. Reliable indications by which the correct blast pressure may be determined are given by the flame coming from the funnel. At the beginning of the melting it is transparent and pale blue, it soon acquires a yellow color and luminosity, and plays gently about the ladle inverted upon the funnel. As soon as the flame begins to lose its color again and rises in sharp jets to the chimney, a sign that the coke is partly burned and that the blast is passing through the shaft with less hindrance, the pressure must be diminished in order to avoid a cooling down of the lower part of the furnace. If the melter has accustomed himself for days to these observations he will readily avoid all spurting. In order to keep down the loss to the lowest possible amount, it is further important to shut off the blast completely and exactly at the proper time. It is at the moment that the last piece of solid metal passes from the funnel through the intermediate vessel into the crucible. If it is delayed beyond this point, some metal will vaporize in spite of the clovering of glass slag. Through a hole in the chimney funnel and colored protecting glass, the disappearance of the last piece of metal can be observed with accuracy, by the use of the above table, accurate observations of the flame and of the progress of melting in the funnel, a young man may learn in a week or two to be a reliable melter, and this the author has often proved. It is easy to keep the loss below 0.3 per cent., and with greater care can be still further reduced. The coke consumption amounts on the average to 18 per cent. of the metal charge, and the metal works perfectly, and it is recommended to add another handful of powdered glass while still very hot, and just after being poured out and skimmed. A thin covering of slag is immediately formed, which is easily pushed aside in pouring, and in the meantime the loss is checked. All fumes cease on the introduction of the glass. Ordinary ladles lined with clay are used for pouring, and these during the melting are inverted over the funnel, supported by cross bars for the purpose of thoroughly heating them. The escaping heat is sufficient to make them bright red, both inside and out. In my observations this is true only in case that the intermediate vessel which has been previously described, is used. In melting metals of low fusibility with a light blast without the intermediate vessel, according to the proceeding first described, there is not sufficient heat at the upper margin of the funnel for a thorough glowing of the ladles, and they must be heated separately, and considerable part of the saving is lost thereby. Bauman assured us that his purpose in melting without an intermediate vessel is to keep down the loss to a minimum. We can see that it does so. But this advantage outweighs the uncertainty of the whole melting process all within intermediate vessel if scientifically carried out. Still a third form of funnel is applied to the Piat-Bauman furnace for the melting of scrap, and this differs considerably from the two forms previously described. Bauman declares this a trade secret, and is said, therefore, to refrain from describing it.

A protecting coat contributes largely to the enduring qualities of the crucible. This has almost the same melting point as the crucible itself. It is made up principally of powdered crucibles, chamotte and quartz sand and various binding materials. Almost every foundry and every furnace maker, and every foreman has a special receipt, each better than the other. The durability of the crucible is the less, as the loss is little or nothing in case of melting increased by more than 50 per cent. by the proper application of such a coat. A hundred heats for a single No. 150 crucible is nothing extraordinary. On the average we can calculate on 60 heats for the best crucibles. A Swiss firm has a yearly average of 85 melts for a crucible.

There remains still to compare the economical working of a tilting blast furnace with those of the old style, or those in which the draught of the chimney is alone used. In the old type of crucible furnace, a melter at $1.00 (4 marks) per day with a helper at 63 cents per day (2½ marks) using two or three furnaces on 10 hour shifts, might scarcely get 10 heats of 220 lbs. of good bronze each. For this he needed 1,200 lbs. of coke, 10-25 crucible of 200 lbs. capacity, and good for 25 heats. The loss amounted to 0.3 per cent. In the Piat-Bauman furnace the same men, and the same time can get 20 heats of 375 lbs. For this 1,300 lbs. of coke are required. The crucible consumption amounts to 20-60 (life of crucible 60 heats), and the loss as in the crucible furnace of old type, 0.3 per cent.

COST OF MELTING 220 LBS. (100 KILOS) GOOD BRONZE.

	Ordinary crucible furnace.	Piat-Bauman furnace.
Wages melter..... } Wages helper..... }	0.65 marks	0.19 marks
Coke	1.37 marks	0.45 marks
Crucibles	0.68 marks	0.25 marks
Loss (0.3%)	0.48 marks	0.48 marks
	3.18 marks	1.37 marks

Cost of melting 220 lbs. in crucible furnace.....80c. = 0.36c. lb.
Cost of melting 220 lbs. in Piat-Bauman furnace..34c. = 0.15c. lb.

There is one feature of the tilting furnace which should not be overlooked, and that is the slight danger to the melter. All accidents resulting from defective crucibles, etc., are obviated.

NEW METHOD OF SAMPLING COPPER.

Sampling copper for analysis has always been a treacherous job, particularly with crude or blister copper. It has been customary to cast such copper in pigs weighing several hundred pounds and to ship them in this manner to the distant refiner who samples them and pays for the copper and precious metals which they contain upon the assay of the samples. Great discrepancies often exist between the assay of the consigner and consignee, and to such an extent oftentimes that law suits result. Such discrepancies do not exist in the assays themselves, but from the fact that the precious metals segregate or liquate to portions of the pig and borings taken from this particular spot will show very much higher gold and silver content than that obtained from borings of other parts of the pig. It

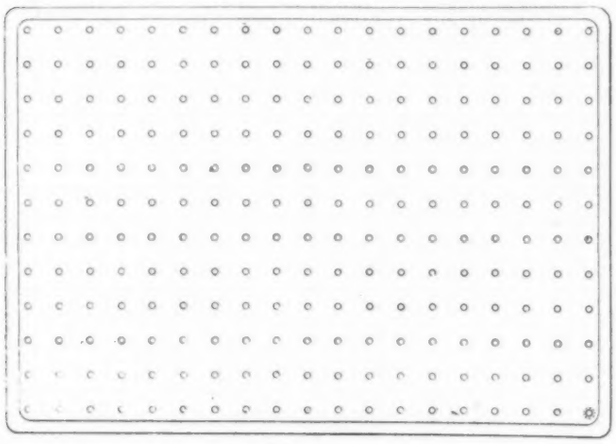


Fig 1.

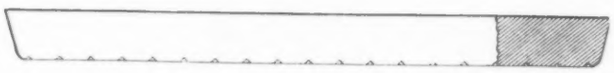


Fig 2

THE CAST PLATE.

is not unusual that assays of one portion of a pig of blister copper will run nearly twice as much in gold and silver as assays of another portion. Recent information in this line show that in certain instances assays of one portion of an ingot of copper gave 7 ounces of gold per ton while other portions gave 27 ounces.

The difficulty is caused by the large mass of copper and the slow cooling of the interior. The gold and silver forsake the copper in cooling and concentrate in the center of the mass or that last to cool. Instances have been known in which seven times as much gold has been found in the center of the pig as the outside.

Ralph Baggaley, of Pittsburg, proposes to cast copper as it comes from the converter in plates 17 x 24 inches and 2 inches thick. A carload of such plates will consist of 240 plates, and in order to obtain an average sample of the carload the plates are countersunk by suitable projections on the mold, so that when the plate is cast there are marks for every hole.

As the gold and silver concentrate in the top of a thin cake, this portion being the last to cool, it becomes necessary to drill clear through the plate. The method pursued is as follows: The first plate which is cast is drilled through one hole and the drillings caught in a suitable receptacle. The next plate is drilled in another hole (each successive plate only being drilled in one hole) and so on until every hole has been drilled in the series. In this manner an average of the whole car can be obtained. The consignee can do likewise, for he has the balance of the holes in each plate undrilled.

THE CAUSE OF THE RISE IN PRICE OF SHELLAC.

As shellac is used in every foundry for varnishing patterns, the following from the United States Consul at Calcutta will be of interest to foundrymen:

Lac is produced in almost every province in India, but principally in the Central Provinces, Bengal, and Assam, from which the largest amounts exported are obtained. That produced in other districts is chiefly consumed in local manufactures of bracelets, rings, beads, and other trinkets worn as ornaments by the women of the poorer classes, and in the manufacture of wood lacquer work, which seems to have been begun in very remote times. Some very artistic work is now done in this line.

Lac is the incrustation deposited by the lac insects on the branches of certain trees, and is collected, as a rule, by the jungle tribes, who break off the branches on which it is deposited. In this state it is called stick lac, and is sold by the gatherers to local dealers, who sell it to the manufacturers of shellac or button lac, who put it through various processes until it becomes the lac of commerce.

The United States and the United Kingdom furnish the principal markets for lac, taking by far the larger part of all that is produced. Smaller quantities are exported to continental Europe. Nearly all is shipped from Calcutta.

During the last fifteen years there have been remarkable fluctuations in the amount exported. Since 1895 there had been a gradual reduction in prices, but during the past two years the product has been comparatively small, while the demand has largely increased. This increased demand is mainly due to the use of shellac in electrical works and in a minor degree for making gramophone records. This increased demand, the small production of the past two years, and the scarcity of stock have attracted speculators, which no doubt has tended to further advance prices. Another reason for the recent advance in prices is the fact that the lac dye, which formerly represented the manufacturer's profits, has been replaced by aniline dyes, and the price of the lac has been increased to make up for the losses due to this falling off in the demands for dye.

The present high prices may stimulate production and reduce the prices, or the increasing demand may cause a further advance in prices. High prices may lead to the adulteration of shellac with rosin, which has frequently been done, but can be detected by the smell.

The Italian Company for the Manufacture of Aluminum is the title of a new company which has just been formed at Rome, Italy, for the production of aluminum and other metallurgical products. The company has acquired the deposits of alumina of Lecce ne Marsi, and the water rights of several thousand horse power in the Val Percara.

THE MANUFACTURE OF ZINC FOIL.

Zinc is supposed to be a refractory metal and not capable of being rolled into thin sheet like other metals of the malleable class, but, in reality, very thin sheet may be obtained from it if the method of making it is known. Common zinc, of course, will not answer the purpose, and only the purest grades can be employed. The brand known as "Bertha" has been used with success. This zinc may be rolled into sheet as thin as .00025 inch in thickness. The method pursued is as follows:

Starting, for example, with sheet zinc about .025 inch thick, which is readily obtained in the usual manner of rolling zinc, the sheet is reduced to about sixteen inches square. The sheet is then passed through the rolls until the length is about twenty-four inches. It is then cut in half, so as to get two sheets, each 12 x 16 inches. These sheets are then laid one upon the other and then folded in the middle, thus producing a package of 8 x 12 inches. This package is passed between rolls presenting the closed or folded end to the rolls, and gradually reducing until the package is about 12 inches long. There is then cut or sheared off a closed end and the package folded as before, but so that the line of fold is at right angles with that of the previous fold, which has just been sheared off. The package is then rolled (which measures about 6 x 12 inches), presenting the closed or folded end to the rolls until it is lengthened to about 9 inches. These operations of cross rolling and of cross folding are repeated until sheets are obtained of about .002 inches in thickness.

The object of this method of folding and rolling is that after every folding, each sheet of a newly formed package shall pass through the rolls in a direction transverse or approximately at right angles to that in which it has passed through in the preceding package. It is only in this way that the results can be obtained.

At any time that the metal should appear brittle it must be heated to about 212° F., and at that temperature be presented to the rolls. This refers to the sheet with which the starting is made, as well as to the packages already referred to and those hereinafter described at any stage. Whenever the edges shows signs of breaking, or when they are not in line with one another, they should be trimmed.

It may be remarked here that, so far as it has been able to determine, it is necessary, in order to obtain a good zinc foil, that the thick sheet (supposed to be .025 inch thick) with which the operation is started should be produced by a process of soft rolling from the ingot itself. Of the various sheet zincs on the market which are known, none of them, so far as has been ascertained, is fitted for the production of the foil. For example, it has been tried to make foil from the softest German sheet zinc obtainable on the German market—and it has been found the moment it is perceptibly reduced, even by cross rolling or folding, it takes on the appearance of a netful of regular holes, and looks like crochet work.

Having thus obtained zinc leaves, about .002 inch thick, then in order to produce the zinc foil, the following method is pursued: Four comparatively thick sheets of zinc are taken, each about .025 inch in thickness, and for purposes of illustration it is assumed that they are 12 x 18 inches in size. They are laid one upon the other with their edges coinciding and fold them in the middle to produce a package or book or eight leaves, each 12 x 9 inches. Fourteen sheets are then taken of the thin leaves .002 inches in thickness and 12 x 9 inches, produced as already described. Put two sheets of the thin between each two leaves of the book or package formed by the thick. The closed end of this package is then presented to the rolls, and then pass the package through them until it has been lengthened about 50 per cent., or in other words, until it is about thirteen and one-half inches long. The free edges are then trimmed, cut or shear off the fold of the edge, fold the package the other way, and thus repeat the operation by successive cross folding and rollings until the thin sheets, interleaved between the thicker ones, have become reduced to the thinness which it is desired to produce. Whenever the surface of the outer sheet of the package appears to become rough or show slight signs of breaking, the package should at once be put between the leaves of a folded thick zinc (.025 inch in thickness) after which the rolling is continued as before. This has been found advisable when the sheets have grown thin. It has also been found that when the sheets have thus grown thin and the package has been put between the fold of a fresh sheet of heavy zinc, the package can be lengthened more than 50 per cent. before refolding it. In the manner above described, sheets of zinc foil have been produced of about .00025 inch in thickness.

The rolled zinc foil produced by this method is very thin and applicable for wrapping soap, tobacco, cigars, candies, etc., or in place of tin foil commonly used and which is much more expensive.

THE VALUE OF A NAME.

The American Metal Company, Limited, the well known metal company, incorporated in 1887 by Adolph Ladenburg, Ernest Thalmann, Alexander H. Stevens and Jacob Langloth, objects to the use of its name by the American Metal Company, incorporated in the District of Columbia in November last by Leigh S. Wilson, R. S. Donaldson and E. W. McCormick. The old company has, therefore, begun an action in the Supreme Court to restrain the newer concern from trading under the name of the American Metal Company.

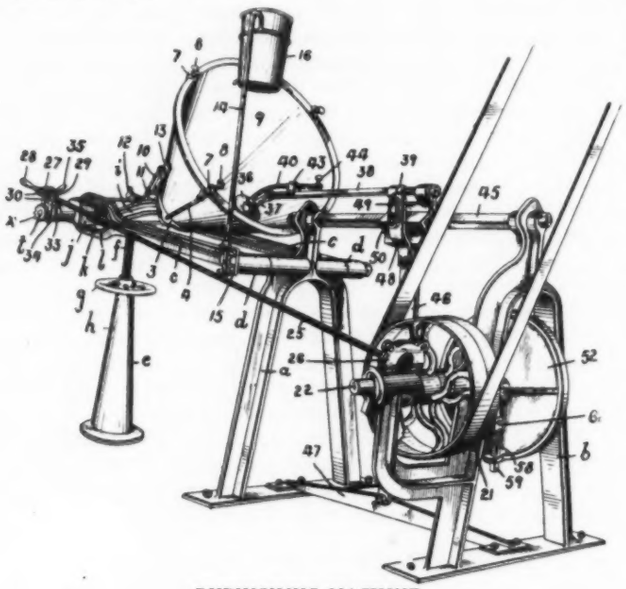
The Ladenburg-Thalmann company had a capital originally of $200,000, but this has since been increased to $2,000,000. The new company's capital is but $50,000, and its principal place of business is in Brooklyn. The old company is in Manhattan. The articles of incorporation of both empower the company to deal in all metals manufactured.

We have received from The Wachwitz Patents Syndicate, Limited, of Holborn, London, a catalogue and samples of their compound metals. These metals include the following combinations of composite sheet: Copper-plated steel, bronze-plated steel, aluminum-plated steel, steel-plated aluminum, copper-plated aluminum, silver-plated aluminum, the sheets being plated on one or both sides. The description of this process of plating was published in the June number of THE METAL INDUSTRY. The company wish to sell the American patent rights and report that the process is at the present time being worked on a commercial scale by a German company, two French companies and a large English company.

It is reported that rich deposits of tin have been discovered in the northern territory of South Australia. About $1,000 worth of metal has been taken from surface workings.

A LARGE BURNISHING MACHINE.

The burnishing of a large reflector, such as that of a search-light or locomotive, is always a troublesome operation. The appliance is difficult to hold and the parts are hard to reach with the usual hand burnisher. All reflectors of the above nature are silver-plated with a heavy coat of silver and then burnished. The surface is then hard and capable of withstanding the frequent and necessary polishing to render the reflecting surface perfect.



BURNISHING MACHINE.

This burnishing machine herewith illustrated is used by a Canadian company, which manufactures goods of this description. By reference to the sketch the principle of the machine will be seen.

The reflector is held by means of a frame and an arm containing the burnisher is reciprocated by the arm. Soap and water are sprayed upon the burnisher by the can overhead.

AMERICAN SILVER PLATE IN GREAT BRITAIN.

According to the advices recently received by the State department, attempts are being made to prevent the entrance of American silverplated ware into Great Britain. There appears to be only meagre knowledge of how it is to be done, but for a long time past there has been an undercurrent of feeling against the sale of our plated goods in the British domain. There is no doubt that inferior goods have been the cause of the outburst and that the competition of even the good grades is being keenly felt. As far as can be ascertained and, the information is obtained from reliable sources, the methods of making flat and hollowware in the United States are superior to those in England. While there are many makers who turn out goods of a cheap and unsatisfactory nature, the quality of the best American plated ware is fully equal to that of the English makers, and our methods of making it are such that goods of equal quality can be turned out much more cheaply.

Cadmium is now used to a considerable extent in making sterling silver. It gives good casting and rolling properties. The usual amount added is 0.50 per cent. and it is introduced after the metal is ready for pouring.

GETTING A FINE SURFACE ON BRASS CASTINGS.

Every jobbing brass foundry once in a while get orders for castings which are required to be smoother than ordinary work. A very frequent job, and one which will serve as an illustration, is a die, the surface of which is sunken and deeply carved with some ornamental design. Such patterns are often made in plaster of paris, and the bronze castings therefrom are used for imprinting decorated designs on the backs of chairs and other wood surfaces, in imitation of carving. They are generally cast in hard bronze, and should the castings be rough, the price of the finished article is greatly enhanced because of the costly tool work. It is requisite, therefore, that the working surfaces of such castings be as fine and smooth as possible, and to secure this it is necessary to "print back" such molds.

The method here outlined I have used with success although it is not generally known, in the sense of being understood by every foundryman, yet it is not new.

Before commencing to mold, if the castings are heavy, it will be advisable to mix up a facing sand. For this take three parts of new and one of old molding sand and to every fifteen parts add one of flour; mix well, wet with water until a little more damp than ordinary "heap" sand. Then screen. Sift this facing onto the pattern through a sieve not coarser than No. 8, riddle filling up the flask with ordinary sand, and ram soft.

In work where there is no impression in the cope, but simply a flat back, it is unnecessary to "print" the cope so it may be rammed as is usual with other work. The cope is then lifted off and the pattern is gently rapped to loosen it, after which the cope is replaced and the mold is rolled over. The nowel being now uppermost, is carefully lifted off the pattern; this operation is assisted by a very gentle rapping upon the sides of the molding tub. The patterns, resting upon the cope, must on no account be disturbed because if they are moved it will be difficult to get them back in place and an imperfect casting will be produced.

The patterns must be scrutinized to see if they have torn the sand anywhere. If so, spray the mold with molasses water and roughly build up the broken places, making them a little "full" and firm enough to hang when the nowel is inverted; now spray again with molasses water, this time thoroughly, and dust on the printing sand. Blow off with the bellows to drive the dust out of any vertical surfaces of the mold; dust the second time with printing sand, but, gently, giving an uniform deposit. Blow out any accumulation of dust from recesses of the mold where it is apt to gather in unnecessary quantities. Now wait a moment until the dust becomes damp, then carefully and thoroughly dust lycopodium over both the impression and the joint of the mold. *Never omit this* or there will be a failure. The nowel is again closed on to the patterns, and the bottom board is removed. The nowel must now be re-rammed, using only the butt end of the rammer. The mold being rammed soft in the first place, the re-ramming brings it to the proper density. The bottom board is again bedded in the place and the nowel lifted off, leaving the patterns on the cope as before. Examine the impressions closely to make sure there is no break anywhere. If there should be, the broken portions must be built up with sand, dusted with a little lycopodium, the mold closed on to the patterns and gently re-rammed over the defective spot. Generally a printed mold, if properly made, will give a perfect "lift," as the surface is much stronger than that of an unprinted one.

A perfect impression being obtained the patterns are removed and the mold is finished in the usual manner, with the exception that it is better not to flour it unless

the flour is dusted through a very fine bag, and sparingly. The mold must be surface-dried before casting.

A more rapid method of "printing back," especially adapted for small metal patterns, is as follows: In this case the necessity for skin-drying or baking is avoided, and the pattern which needs special treatment may be run in the same mold with other patterns which do not need the printing. When the odd side is made, the patterns which need only ordinary treatment are placed in such position as are usual with ordinary work, but the one which must be printed is arranged with its surface lower, that is, its parting line is sunk into the match about three-eighths of an inch so that when the match is lifted off the inverted nowel this particular pattern will be raised three-eighths of an inch above the joints of the flask. Before any trimming is done to the joint, this pattern is removed and its impression is dusted with the facing and then with lycopodium and the pattern is replaced and driven down into the sand until its parting line coincides with the joint of the flask. This prints it back perfectly. The joint is now trimmed and the cope is rammed.

The cope may also be printed if necessary. All that need be done is to dust on facing first, then lycopodium, close down and re-ram. The mold may then be finished in the usual manner. This method of printing, while it is only applicable to patterns that may be rammed down, is very useful, as it admits of molding fine and ordinary castings in the same flask, with little extra work. It must be observed that in this case water is sprayed on sparingly if at all, and skin drying is not necessary. There are other methods of making fine brass castings than the one here outlined, manufacturers who make a specialty of artistic castings are naturally equipped for their chosen class of work, and have their own methods of making it, born of experience and experiment. With a specialist, therefore, this article is not intended so much as the ordinary jobbing brass foundry where French sand is not known, even by name, where all the sand piles are the same, neither very fine or very coarse; where they can make light thin castings one day and heavy machinery castings the next.

To properly complete this article a description of the material used for "printing back" as well as of methods of skin drying is necessary. I have experimented largely with different materials suitable for printing back, one of the first things tried being the molding sand dust from the shop floor; I then tried all new sand dried. The new sand is superior to the dust, and it is improved by the addition of flour. Plumbago, charcoal, and soapstone were all tried and found wanting. Finally, new sand was put into an old crucible, burned in the furnace and afterward pounded fine in a mortar; about one part of flour to eight of sand was added, and as much of this mixture as can be handled conveniently is put into a bag of close texture from which is dusted on to the mold as required.

The field for experiment will be found in printing sands, the object being to obtain a mixture that will produce on the casting a bright, smooth surface, and will not blow, and cut or scab.

It is not always necessary to surface dry a printed mold, provided the printing sand will cling to the mold and not wash or peel without being held down by molasses water. The use of molasses water, of course, necessitates drying, as it introduces too much moisture.

In all cases where there are delicate sand projections in a mold common sense will suggest that it is safest to dry, and the molasses water may then be used freely, as it strengthens the impression.

In drying flat work, such as name plates, and so forth, a blue torch is serviceable, but on deeply cut work the torch will burn off thin ridges or projections of sand, and leave the deep cavities green enough to "blow." For such work a charcoal fire is the best and the easiest to apply. Take a piece of the bottom of an old sieve, prop it horizontally a couple of inches from the floor to permit a draught of air to pass through it, when it becomes a grate for the charcoal fire. Over the sieve put an iron ring that will hold a couple of handfuls of charcoal, a piece of two or three inch stove pipe is as good as anything. Place a little charcoal inside the ring, then a red hot coke, and more charcoal; a good hot fire is the result.

The oven is made by placing two or three flasks (the same size as used for the mold) over the fire. The mold is dried half at a time. The cope or nowel, being closed, impression down, over the top flask of the oven, the fire is thus underneath, so the mold gets the benefit of all the heat and is quickly and thoroughly surfaced dried.

Anticipating inquiries as to lycopodium, I may as well state that it is an impalpable yellow powder. Its value as a parting medium lies in the fact that it will not mix with water, and while it is very inflammable it does not boil like rosin under heat and roughen the casting; therefore, it is invaluable for "printing back," preventing a thin layer of facing from sticking to the pattern; for this purpose it has no equal. Most of the lycopodium of commerce comes from Russia, and is, I believe, merely the pollen of the club moss.—(C. Vickers in American Machinist.)

A NEW ALLOY.

A new alloy has been discovered by Richard B. Wheatley, of London, England, in which the metal strontium is introduced. This is the first instance in which this metal has ever been made to play any part in commercial alloys.

It is claimed for the alloy that it has great tensile strength, beautiful gold color and may be spun and stamped. Its resistance to atmospheric influences is also said to be great.

To make the alloy a combination of the strontium and zinc is effected. Zinc is heated with sulphate of strontium until the mixture is produced which is then used for making the alloy.

The alloy consists of the following ingredients:

Copper	60.8	per cent.
Zinc	37.6	"
Manganese	.2	"
Iron	.1	"
Tungsten	.3	"
Aluminum	.3	"
Tin	.4	"
Strontium	.3	"
	100.0	per cent.

The inventor states that the strontium enables the tungsten to combine with the other metals and produce a homogeneous alloy.

A concern hailing from Kentish Town, England, has made an offer of five pounds sterling for the first person giving them a new method of burnishing collapsible tubes.

THE MANAGEMENT OF NICKEL PLATING BATHS.*

Among some of the chief precautions which are generally observed by the nickel plater, he is careful to procure only pure and neutral ammonium sulphate for forming his plating solutions, and he is also very careful to see that his bath is kept permanently neutral, quickly remedying any small irregularity in this respect. He is, moreover, very careful to prevent the introduction of any traces of organic matter and generally has preference for comparatively soft nickel anodes which are found to be less liable to cause the bath to become acid, since they are more readily soluble than a hard rolled nickel one.

Although at one time it was only possible to obtain very impure nickel at the rate of $4 or more per pound, yet the present day an anode of practically pure metal can be produced at 40 to 50 cents per pound. Nevertheless, even at this price the anode becomes a rather seriously outlay to smaller platers; in consequence of which they have resorted to the use of rolled nickel which, being much thinner and stronger, and consequently lighter for a given available surface, necessitates an output of considerably less capital. It has been claimed for rolled anodes that they dissolve away evenly, do not become soft and disintegrate and that they last a long time. It is a peculiar fact, however, that these claims, so far from showing any desirable features, seem to show how unsuited rolled nickel is for use as anode metal.

The several essentials in the management of nickel plating plants, worked for profit are a high current efficiency, a low voltage (or in other words, a high energy efficiency), and the power to continue for a long period of time, preferably without undue attention to the acidity of the solution, the deposition of a bright, coherent, non-porous film of metal.

When an ordinary nickel plating bath containing about three-fourths of a pound of nickel ammonium sulphate to the gallon of water is started, the current efficiency of the deposit upon the cathode at ordinary current densities tends to approach a value betwen 90 and 100 per cent., and this state of things would be maintained if the proportion of nickel in the solution could be kept constant. The solution, however, depends entirely upon the anode for the replenishment of the nickel used up, and it will be easily seen that if this supply is less rapid than the demand at the cathode, the bath will become impoverished of its nickel and the depositing efficiency will, in consequence, be reduced. Three most important things in the process of nickel plating—namely, the current efficiency of the deposit, state of the bath, and the condition of the film will, therefore, be seen to depend upon one factor, the rate of supply of nickel to the bath, or, in other words, the corrosion efficiency of the anode.

It has been seen that the depositing efficiency tends, under favorable conditions, to approach a value of about 90 per cent., and it will be seen, therefore, that the corrosion efficiency of the anode should, under like conditions, be of a similar value. In the light of these facts a series of most important experiments has been conducted by Profesors O. W. Brown and described in a paper lately read before the American Electrochemical Society. Four different kinds of anodes were experimented upon as follows: (a) Cast nickel with the surface ground smooth; (b) cast nickel with the surface roughened in acid; (c) pure rolled nickel; (d) electrolytic nickel.

It was found that when these were used as anodes in the usual bath of nickel ammonium sulphate, the current efficiency of their corrosion was as follows: (b) 91.32 per cent.; (a) 46.29 per cent.; (d) 12.65 per cent.; (c) 8.47 per cent. The effect of this would be obvious enough. Anode (b) would maintain a proper state of things in the bath, while anode (c) being the worst, would allow the bath to quickly deteriorate and become acid, while the depositing efficiency would gradually diminish. If no efforts were made to keep the bath artificially neutral, the increasing acidity would enable the anode corrosion efficiency to increase, but the state of the deposit would be unsatisfactory, whereas, if anode (b) were used the bath would have practically no tendency to deteriorate and would, therefore, give more lasting and more satisfactory results. These facts are verified by experiment and in practice.

There is another set of conditions which, up to the present, has not been dealt with. They relate to the voltage across the bath. This factor is a very important one from the practical plater's point of view, since he has to pay for all the energy wasted by inefficiency in this respect. But, as will presently be shown, it is even more important than is generally supposed, since it has a direct bearing not only upon the amount of useless energy being expended, but also upon the current efficiency of the deposit and upon the state of the bath itself.

In the foregoing experiments upon anode corrosion efficiency some very interesting readings were obtained of the discharged voltages of the anodes. These voltages, when taken in conjunction with those of the cathode which, in these experiments, were nearly constant of a comparatively low value of opposite sign, represent the back electromotive force of the vat against which the current has to be driven. It was found in the case of anode (b), where the corrosion efficiency was high, the voltage was only 0.44, whereas in anode (c), where the corrosion efficiency was lowest, the voltage attained its highest value, being 1.889, or practically 2 volts. These peculiarities were found to be explained by the fact that nickel, like iron, is capable of assuming a "passive" state or a condition in which it appears to have become temporarily electronegative. As long as the nickel anode remains in its normal condition the voltage of corrosion and the efficiency of corrosion are respectively good; but when the "passive" state is reached this critical electromotive force is at once greatly increased and the corrosion efficiency correspondingly diminished.

As has already been seen, the difficulties may be avoided to some extent by the judicious choice of a suitable anode, cast metal with a roughened surface being decidedly preferable in this respect. It is, in fact, apparent that a small proportion of carbon, copper or other impurities electro-negative to nickel is a real advantage, since it causes the anode to dissolve with a roughened surface and consequently avoid the production of a passive state.

The peculiar passive state of the anode, as already pointed out, discloses itself in the suddenly increased potential voltage, so that this may be made use of to detect this condition of things in the following manner: Assuming that a nickel-plating bath is running under the ordinary conditions at an anode current density of about 5 amperes per sq. in. of active surface (a density recommended as being appropriate) the discharge potential across the vat is obtained by sud-

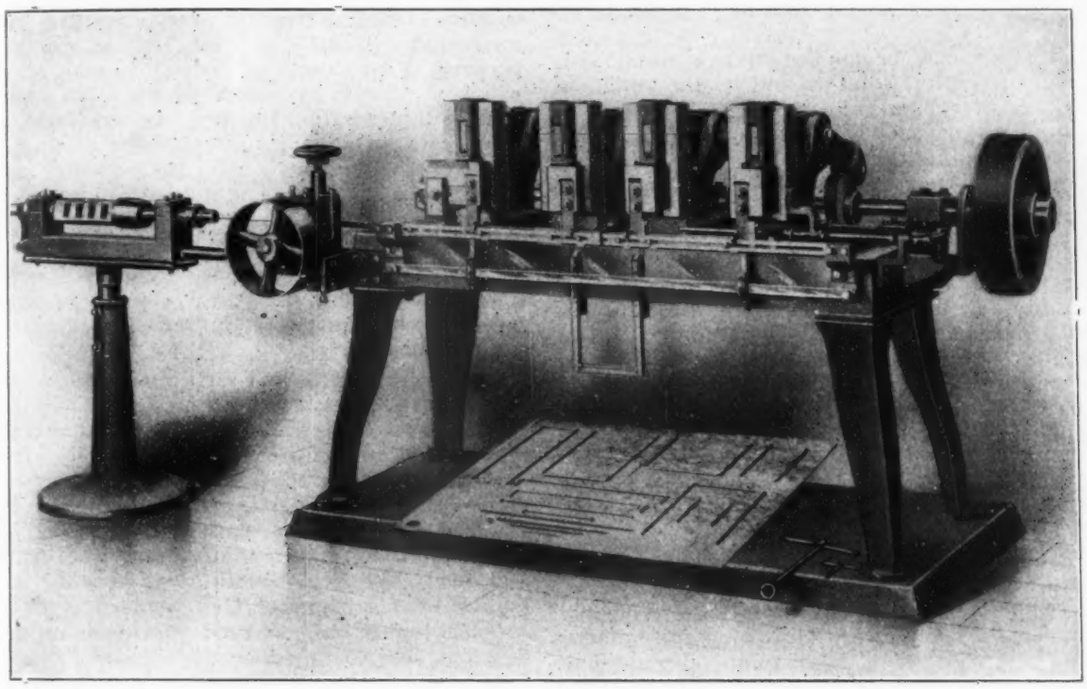
*A. A. Beadle, in *The Metal Worker, Plumber and Steam Fitter.*

denly breaking the plating current and throwing across the terminals of the vat a high resistance accurate reading volt-meter, upon which the polarization potential is quickly read. If this potential does not exceed a value of 0.45 volts it may be safely assumed that all is well but if it appreciably exceeds this value, and it may rise to nearly 2.0 volts, the passive state of the anode has been reached and the plating should be discontinued. A rest and the removal, scraping and cleaning of the anode will then be necessary to restore the normal conditions of the vat. Such precautions, although at first sounding somewhat complicated are, in reality, simplicity itself, and may help the plater to a better understanding of the process and a better control of his solutions.

THE NEW SHUSTER WIRE FORMING MACHINE.

A new automatic wire-forming machine for large shapes has been brought out by the F. B. Shuster Company, of New Haven, Conn., which is not only novel in working, but is used on the manufacture of wire goods of large size wires; an achievement which has been sought for a long time. The machine is used for the making of broilers, oven-racks, bakers' pans, and kitchen utensils. A great variety of shapes may be made on the machine and it is readily adjustable.

The wire is fed from a coil to an oscillating, rotary straightener and introduced into the machine in a straightened condition. The operations of feeding the wire and forming are kept separate and the forming presses remain at rest during the feeding of a new piece of wire into the machine. The machine is adapted for many varieties of work and the well-known character of the Shuster machine is fully manifested in the design. Those who are working wire should investigate the merits of the machine and the F. B. Shuster Company will be pleased to give a full description of this unique piece of machinery. One view of the machine is herewith shown.



SHUSTER WIRE FORMING MACHINE.

BRIDGEPORT FASTENER.

NEW BRIDGEPORT FASTENER.

The accompanying cut shows the new fastener manufactured by the Bridgeport Chain Company, of Bridgeport, Conn., and three styles of links of the company's key chains. By closing the lever of the fastener the spring jaws are firmly set. Tools are being prepared to supply these fasteners with various attachments, such as bachelor buttons, cuff holders, etc. The three types of chains are manufactured in steel, nickel plated and two of them in aluminum. The company are turning out aluminum chains annually at the rate of several thousand gross.

CORRESPONDENCE DEPARTMENT

In this Department we will answer questions relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A maker of zinc eyelets has had trouble in stamping the eyelets from common zinc and wishes to know if he cannot add something to the metal to render it more readily worked.

A.—Common zinc will not work at all well under the press. The very pure grades are the ones used for the purpose. You can obtain this sheet from the various makers of rolled zinc. Common zinc contains both lead and iron which renders it unsound for drawing. The purest metal is the one which gives the best results.

Q.—A subscriber has had difficulty in applying the chocolate finish to brass and wishes more complete directions.

A.—This finish may be applied in two ways, viz.: By the liver of sulphur solution and by the ammonia and carbonate of copper solution. The liver of sulphur solution is made up in proportions of about 2 oz. to the gallon and applied cold to the brass. In order to obtain good results, however, it is first necessary to copper plate the brass. The liver of sulphur solution does not work well on common brass. Give the work a light flash in the cyanide of copper plating solution and then treat as above.

The solution of carbonate of copper is made by dissolving the carbonate of copper in ammonia. The strength does not matter much. Dissolve 1 lb. of the carbonate in 2 gallons of water and you will have a good bath. This works well on yellow brass, and can be used hot or cold. If warm it works more rapidly.

Q.—The formula for soft solder which will have a yellow color and can be used with a soldering iron is desired.

A.—No such solder is known. All the soft solders, i. e., those which can be used with the soldering iron, are white. The yellow solders are composed of copper and spelter and are known as the brazing solders. They melt at a high temperature. The yellow solder with the lowest melting point consists of half copper and half spelter, but this cannot be used with the soldering iron.

Q.—A subscriber states that he has tried the method of producing silver deposit work given in THE METAL INDUSTRY, and finds that, although he is able to obtain the deposit with the solution, this is dissolved as soon as it is put into the cyanide bath.

A.—The trouble is on account of the fact that the amount of silver deposited by the first solution is so small that it is quickly dissolved by the cyanide. This may be obviated by first connecting up the work before placing in the bath so that action begins immediately upon the immersion. In making the first deposit in the solution given, the whole should be exposed to the sunlight and a stronger and more dense film can then be obtained.

Q.—The formula for a No. 1 britannia metal is desired.

A.—Britannia metal for casting in metal molds is composed of the following:

Tin	210 lbs.
Antimony	12 lbs.
Copper	4 lbs.

If too hard the amount of copper may be reduced. For rolling, the alloy of course needs to be softer than for casting.

Q.—A maker of ornamental iron work informs us that he has had much trouble in plating cast iron posts. The posts show pin holes after being polished and these are soldered up as well as possible. After plating, however, the acid seems to work out of the holes and, coming through the plating, spoils the work.

A.—Pin holes are frequent occurrences in cast iron and a casting without them is difficult to obtain. The great trouble in plating such work is from the fact that the acid used for pickling is absorbed by the cavities and is not removed by rinsing. These cavities often penetrate very deeply. The only method known to avoid the trouble which you experience is to allow the casting to soak in water, to which a little bi-carbonate of soda has been added. This will neutralize the pickling acid and the difficulty will partially disappear. The plating solution, however, will also enter the cavities and come through the plating. The only sure method is to obtain good castings. They can be had if care is taken in molding.

Q.—A plater who is plating nickel directly on to steel is troubled by a large number of minute pin holes which drag under the buff and produce an unsightly surface.

A.—There may be several causes of your trouble. Your current may be too strong. This will cause the work to become covered with innumerable bubbles, which, of course, give you trouble. Again, the bath may have become acid, and the acid immediately acts on the iron with evolution of hydrogen forming bubbles and, consequently, pin holes. If this is the case, add ammonia until the neutrality is restored. The acid condition of your bath may be known by test paper. A slight flash of copper in a cyanide copper bath will aid you in obtaining a good deposit. Then transfer to nickel bath.

Q.—The method of producing the Genuine Bower-Barff finish is desired.

A.—This finish is only possible on iron or steel goods and is produced by heating the articles in a muffle, closed, and to which steam is admitted. The iron or steel then becomes covered with a film of magnetic oxide of iron, which is not only lasting but protects the metal underneath.

Q.—A manufacturer who is plating iron work with brass says that his work stains after being buffed a few hours. He uses a cold solution.

A.—It is probable that you are not getting a good deposit. Try heating your solution as recommended in an article on brass plating in THE METAL INDUSTRY, April, 1904. It is difficult to give you a more definite answer on account of the meagre knowledge of the condition of your bath.

Q.—The proper method of bending brass tubing is desired.

A.—The tube is filled with sand, rosin, or lead, and, after the ends have been stopped, it is bent in the usual manner. Sand is easily applied and answers in many cases, but if a very nice job is desired, lead or rosin give the best results, as there is then no danger of the tube flattening at the bend.

Q.—A manufacturer of chandeliers asks us for directions for producing the finishes found on these goods known as light and dark verde.

A.—These finishes are produced by means of lacquer colored with suitable pigments. For instance carbonate of copper produces the usual green shade found on the verde antique. If darker color is desired a little lampblack may be mixed with it. The dry color, which must be very finely ground, of course, is mixed with any suitable lacquer and applied with a brush. Excellent effects may be produced by applying the lacquer with the pigment and then removing it from the high lights, leaving only in the hollow parts. Of course the matter is entirely subject to the taste of the operator and depends upon him for the results. Do not use any but mineral pigments, as they are the only ones which are not fugitive in color.

Q.—A maker of fine brass wire desires to know how the uniform golden color is produced on the annealed wire when in the coils. Sample is sent to illustrate the color.

A.—The wire sent for examination has been annealed in steam so that there is no oxidation, and hence no pickling is required. The wire was probably annealed by the Bates-Beard process which was described in our July issue, to which you are referred.

Q.—A manufacturer of plated ware states that he is having some trouble in obtaining an even deposit of copper with an acid copper solution on antimonial lead. The castings are first struck with silver in the usual silver striking bath, then in the copper bath and afterwards transferred to the ordinary matt dip. It is in this matt dip that the difficulty appears. The points nearest the anodes have a fine matt surface, while the lower places come out bright and look as if they had been scratch brushed. The solution has been run for a long time with good results, but the difficulty above mentioned has just appeared.

A.—Your work is undoubtedly too near the anodes, and there may not be a sufficient anode surface. Your solution may also have become too acid from long running. It is impossible to give you any further solution of your difficulty on account of the fact that so little is known of the condition of your bath. It would seem to us, however, that the removal of the work further away from the anodes, provided your bath is in good condition, would obviate your difficulty.

Q.—The method of producing the French gray finish on silver-plated novelties is desired.

A.—This method has already been described in detail in THE METAL INDUSTRY, and we refer you to our issues of June, 1903, and January, 1904, in which the process are fully described.

Q.—The method of producing the fine blue color found on steel buttons is desired.

A.—This blue color is the result of oxidation, and is produced by carefully heating the polished steel buttons to the proper temperature. The steel buttons are first polished by means of the tumbling barrel and leather or, if the price will admit, burnished. They are then placed in the barrel of a furnace and rotated until the desired color is obtained. They are then immediately dumped into water.

The furnace for this purpose is made by The American Gas Furnace Co., of 23 John street, New York, and is especially adapted to this work. Any kind of small work may be blued in it. The blue color on steel is always obtained in this manner.

BOOK REVIEW.

Transactions American Electrochemical Society. We have received Vol. V. (1904) of the transactions of this society published at 39 South Tenth street, Philadelphia, Pa., and find it complete with the usual number of interesting articles. The volume is illustrated with a frontispiece of a portrait of Henry S. Carhart, the president, and also with numerous cuts. Among the articles of interest may be mentioned "The Continuous Advance of Electrochemistry," "The Economic Balance in Electrolytic Copper Refining," and "Electrolytic Iron," all of which will prove interesting to our readers. The volume is sold in bound form, and is bound in an attractive manner. Those interested in the scientific study of electrochemistry will find it a valuable acquisition.

The use of aluminum for annealing steel has been patented by Leonard D. Davis, of Erie, Pa. The steel is immersed in an aluminum bath in the same manner that a lead bath is used. It is claimed, however, that aluminum is superior to other metals for the purpose for the reason that its melting point is near the annealing temperature of steel. The steel comes from the bath in a clean condition, as the aluminum does not adhere readily to the metal, and, at the same time, is free from scale. The affinity of aluminum for oxygen is apparently responsible for this. Aluminum alloys are as applicable as the pure metal.

Charles A. Cotter, of the Chase Rolling Mill, Waterbury, Conn., died on August 22d of pleurisy. For many years he was a familiar figure in the brass industry of the Naugatuck valley. His father was at one time superintendent of the Ansonia Brass & Copper Co., and with whom he was associated. Later he was superintendent of Randolph & Clowes plant, and afterwards proprietor of The Cheshire Rolling Mill. Of late he was connected with The Chase Rolling Mill.

The English brass and silver trades have ramifications which are unknown in our own country. Some time ago orders were received by a Birmingham firm for solid brass coffins for an African potentate, with arrangements for locking the lid from the inside. A Sheffield firm has now received an order, presumably from the same potentate, for some solid silver furniture.

A vein of copper ore has been discovered under the buildings of Columbia University at Morningside Heights, New York City. It is a peculiar fact that this discovery was made soon after a gift of $250,000 had been made by Adolph Lewinsohn, of the Amalgamated Copper Company, to the university for a new mining building.

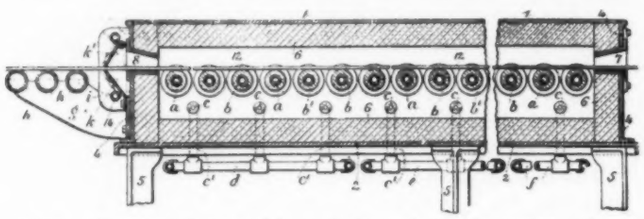
Dr. Hans Goldschmidt, of Germany, will visit the St. Louis Exposition as a delegate of the Bunsen Society and will deliver an address on his invention "Alumino-Thermics" before the International Electrical Congress, which will meet at St. Louis in September.

Edward J. Cabble, a member of the wire goods company of William Cabble & Co., Brooklyn, N. Y., died on August 16th, aged 50 years. He was connected with the mechanical department of the company's business for nearly 35 years.

PATENTS

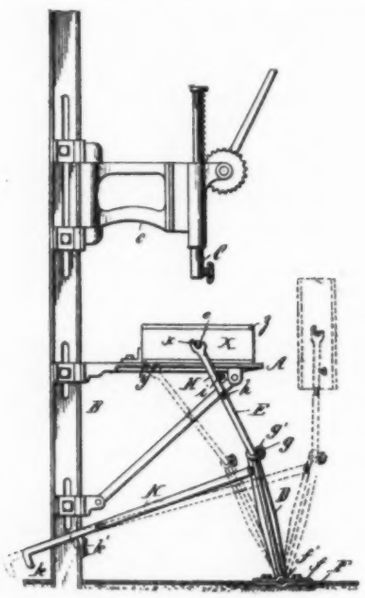
A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

762,654. June 14, 1904. METHOD OF ANNEALING AND TEMPERING FORMS OF METAL. Edward P. Reichhelm, Bayonne, N. J., assignor to American Gas Furnace Company, Elizabeth, N. J., a Corporation of New Jersey.—The method herein specified of treating strips, bars or other forms of precious or semi-precious metals and preserving the bright polished surfaces thereof, for annealing and tempering the same, consisting in conveying said



forms of metal along within and through a substantially closed chamber from which the atmosphere is excluded and subjecting the same in transit to the direct heat of air and gas flames, and thereafter cooling the same in the presence of the heated products of combustion and before said forms of metal are admitted to the presence of the atmosphere, substantially as set forth.

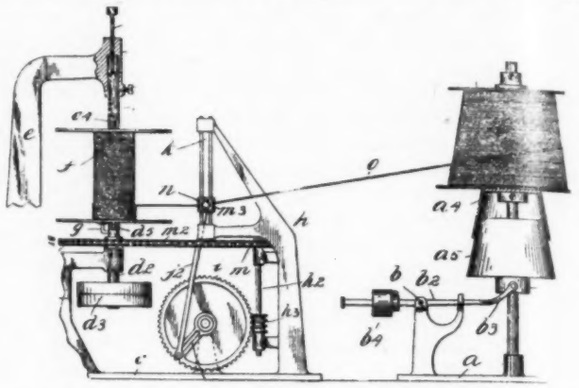
765,332. July 19, 1904. MOLDER'S FLASK-SUPPORT. John C. Bradley, Buffalo, N. Y., assignor to Pratt & Letchworth Company, Buffalo, N. Y.—The combination with a table for support-



ing the flask, of a swinging flask-support pivoted at its lower end and provided with separated arms arranged to swing past the table at opposite sides thereof and having bearings at their upper ends to engage parts on the opposite sides of the flask, substantially as set forth.

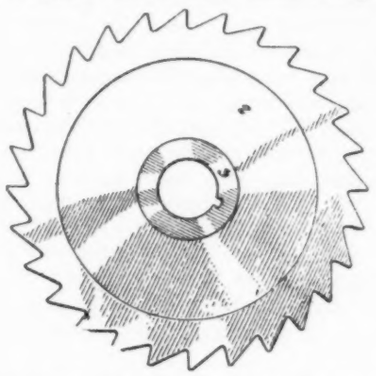
765,473. July 19, 1904. APPARATUS FOR HANDLING COILED BUNDLES OF RODS OR WIRE. Jerome R. George, Worcester, Mass., assignor to Morgan Construction Company, Worcester, Mass., a Corporation of Massachusetts.—In an apparatus for handling coiled bundles of wire, the combination of a truck, an inclined coil-support at one end, an elevated platform from which the coils are discharged, with free space between the end of said platform and said inclined support to allow the coil to turn as it falls into an inclined position, substantially as described.

761,283. May 31, 1904. APPARATUS FOR WINDING WIRE ONTO SPOOLS OR SHUTTLES. George H. Berthelot, Bayonne, N. J.—In an apparatus for winding wire on a spool, a vertically arranged wire-drum support having a drum mounted thereon, a vertically-movable brake operating in connection with said drum, means for regulating the pressure of said brake, means for supporting a



spool in an upright position, a vertically-movable slide mounted between the spool-supporting means and the drum-support, a wire-guide connected with said slide, devices for rotating the spool, a gear-wheel supported beneath said slide and in operative connection therewith, and a vertically-arranged shaft geared in connection with said wheel and in connection with the spool-rotating device.

764,145. July 5, 1904. ROTARY METAL-CUTTING TOOL. William H. McKenna, Pitsburg, Pa.—A rotary metal-cutting tool having



a single-piece-cutting periphery of self-hardening steel integral with a center of softer material; substantially as described.

763,665. June 28, 1904. EXPLOSIVE COMPOUND. Charles M. Hall, Niagara Falls, N. Y.—The herein-described blasting agent, consisting of a finely-powdered brittle alloy containing aluminum, iron and silicon, and nitrate of ammonium; substantially as described.

764,862. July 12, 1904. PROCESS OF MAKING METAL RINGS. Frank Mossberg, Attleboro, Mass., assignor to Frank Mossberg Company, Attleboro, Mass., a Corporation of Rhode Island.—The method of forming rings, consisting in drawing a blank into the form of a cup and simultaneously swaging or forcing the upper inner edge outward, and drawing the lower outer edge into a rounded form, all in the same operation; punching the bottom from said cup, whereby a ring-blank having tapering edges is secured; and finally forcing said upper edge inward, whereby a plano-convex ring is formed.

TRADE NEWS

When You Have Any Trade News of Interest Send It to THE METAL INDUSTRY, 61 Beekman Street, New York.

All grades of aluminum are kept by Richards & Co., 60 Union street, Boston, Mass.

The Cleveland office of the Waterbury Farrel Foundry and Machine Company is now located at 428 Williamson Building.

The Bristol Company, of Waterbury, Conn., are issuing an illustrated pamphlet which describes their recording instruments for pressure, temperature and electricity.

The Phillips Insulated Wire Company, of Pawtucket, R. I., report that their rolling mill is not yet in operation and probably will not be until about the first of the year.

The Ross-Tacony Crucible Company advertise to manufacture the best brass and steel crucibles and ask for a trial to prove their assertion.

The Empire Metal Company, of Syracuse, N. Y., are issuing a new booklet descriptive of their metals, which include tin, lead, zinc, copper, antimony, aluminum, bismuth and phosphor tin.

The Aluminum Cooking Utensil Company have an attractive exhibit of domestic and hotel ware in the Manufactures Building of the St. Louis Fair.

The R. B. Seidel, Incorporated, Philadelphia Black Lead Crucible Works report a steady demand for their uniform quality crucibles.

Contracts have been let for the new pattern and blacksmith shop of the Olds Motor Works, Lansing, Mich. The pattern storage building is 70 x 85 feet, two stories high.

The Metal Manufacturing Company, of New Haven, Conn., have issued a catalogue showing their line of picture hooks, pole brackets, curtain rods, bird cage springs, etc.

The Western Brass Manufacturing Company, of Chicago, Ill., have tripled their manufacturing facilities and increased their capital stock from $5,000 to $10,000.

Wickwire Bros., of Cortlandt, New York, manufacturers of wire and wire cloth, are making additions to their establishments in the shape of two large buildings.

Merkel Bros., of Cincinnati, Ohio, makers of plumbers' goods, are planning a seven-story building, to be used for the manufacture of their products.

The Cheshire Novelty Company has purchased the business of the Booth Manufacturing Company, of Bristol, Conn., manufacturers of brass hardware and novelties.

The proposed lead merger of the United Lead Company and the National Lead Company has not yet gone through. An official of the United Lead Company recently made the statement that it is now doubtful if the merger will take place.

A model brass shop is that of William Durst, 4 Water street, Brooklyn, N. Y. Mr. Durst manufactures all varieties of brass goods and does drawing, stamping, spinning, polishing and electroplating. He makes a specialty of brass railings.

The Hurwood Manufacturing Company, of Bridgeport, Conn., makers of hardware, are about to install a new plating department. The company are now settled in their new plant and report excellent prospects for the future.

A combination of cartridge makers is said to be under consideration. This combination is not to consist of all the makers, but of some of the smaller companies, and in which will be included some of the new powder manufacturers.

The Gonce Lock Manufacturing Company has been incorporated with a capital stock of $10,000, at Chattanooga, Tenn. for the manufacture of a keyless combination lock, patents for which have been issued in this country and abroad.

The Milford Silver Company of Milford, Conn., has sold its business and plant to the William A. Rogers Company, of Niagara Falls, N. Y. The machinery has all been shipped to Niagara Falls and the business closed.

John W. Morse, formerly in the scrap metal business at Waterbury, Conn., has associated himself with Fred Downs, whose warehouse and office is at 243 Front street, New York City. Mr. Morse will give up his business at Waterbury.

The Wagner Manufacturing Company, of Sidney, O., have an interesting exhibit at the St. Louis Fair in the Palace of Manufactures, and at their booth are handing out a miniature model of the first casting made in America, being an iron kettle cast at Lynn, Mass., in 1642.

The Aluminum Manufacturing Company, of Two Rivers, Wis., are issuing campaign trays. In the center of the tray is a halftone print of the White House and at each end portraits of the Republican and Democratic President and Vice-Presidential candidates.

David Trubee & Co., of Bridgeport, Conn., have been appointed Eastern agents of the Roberts Chemical Company for the sale of their caustic potash. This company report that in every case where a trial has been made of their potash that it has resulted in its continued use.

The American Waltham Watch Company, of Waltham, Mass., has recently erected a chimney 175 feet high and also has placed a watch with a 20-foot dial upon their new steel building. The watch will be illuminated at night and the time can, therefore, be learned at a long distance.

Fred Downs & Co., metal dealers of Front street, New York City, are erecting a copper smelting plant in Elizabethport, N. J., for the smelting of all kinds of copper bearing material. The plant is being erected under the superintendency of Mr. Cooley, and it is expected that it will be in operation in a short time.

We have received from the John Porteous Manufacturing Company, Cincinnati, O., their catalogue of the Porteous Portable Metal Melting Furnace, which is designed for melting brass, copper, zinc, aluminum, tin, lead, steel, cast iron and malleable iron. The furnace is built upon a truck and can be placed in any position in a foundry.

The property of the Omega Steel Company, New Haven, Conn., has been sold at public auction by order of the court. The upset figure was placed at $3,500, the amount of the liabilties. This company was one of the pioneers in the self-hardening steel industry, and the use of the steel in the brass industry has been quite extensive.

The Acme Wire Company is about to begin the manufacture of bare and insulated copper wire at New Haven, Conn. This company was recently incorporated under the laws of Connecticut, and is now occupying the New England Electrical Company's plant. The New York office of the Acme Wire Company is at 42 Broadway.

The Holmes, Booth & Haydens Company, of Waterbury, Conn., are to erect a one-story frame addition to their wire mill for the manufacture of copper wire. The plans were prepared by the Benedict & Burnham Company, also a part of the American Brass Company, and who have charge of the building operations and improvements at the Holmes, Booth & Haydens mill.

The plant of the American Casket Hardware Company, of Westfield, Mass., has been purchased by Gilbert Rogers and he has placed in charge W. H. Whitney, a former owner of the plant. Gilbert Rogers is a member of the firm of C. Rogers & Bros., of Meriden, Conn., but the Westfield plant will remain where it is and will not be brought to Meriden.

The Grant Manufacturing Company has been incorporated at Bridgeport, Conn., and are erecting a factory for the manufacture of machinery and small metal goods. The capital stock is $50,000 and the incorporators are J. G. Kingsbury, T. R. Hugo, G. R. Thorpe, F. C. Clark and A. E. Kingsbury. The company will also deal in metals.

The Reeves Manufacturing Company, of New Haven, Conn., is about to begin the manufacture of gas meters. The capital stock has been increased and an additional space secured. The Reeves Company has made clock movements and prepayment meters for many years and their new line is an industry with which they are quite familiar.

In order to do a greater manufacturing busines the Johnson-Larson Company has been organized at Salt Lake City, Utah, with a capital of $2.500. The officers are: O. A. Larson, president; Minnie Johnson, vice-president and secretary, and A. G. Johnson, manager and treasurer. The company will manufacture all kinds of architectural sheet metal ornaments.

The brass foundry business of Howard D. Phelps, of Ansonia, Conn., has increased to such an extent that his present quarters are inadequate. He is now erecting a new factory on Beaver street. The new factory will be 35 by 80 feet and will accommodate over three times the number of hands now employed. Mr. Phelps expects to have his new factory completed by November.

The Globe Machine and Stamping Company, of 970 Hamilton street, Cleveland, O., have acquired the machinery, merchandise and good will of the sheet metal stamping shop of Otto Konigslow, which was located at 49 Michigan street. As a result of this purchase the Globe company's facilities are greatly increased and they are prepared to execute orders promptly and at low prices in a greater variety of lines.

The Hazard Manufacturing Company, of Wilkesbarre, Pa., manufacturers of copper wire, bare and insulated, as well as steel wire and wire rope and cable, have opened an office and warehouse in Chicago. The office is located at 71 West Adams street, and will be in charge of Robert A. Peet. Homer A. Wessell, Jr., will be his assistant. A complete stock of all their products will be carried.

The S. Obermayer Company, of Cincinnati, O., manufacturers of foundry facings and foundry supplies, secured the entire order for foundry supplies to be used by the U. S. Government at the Watertown Arsenal at Watertown, Mass., for the ensuing year. Besides the foregoing, this company have contracts also from several U. S. navy yards for foundry supplies and foundry equipments.

The Victor Metals Company, with offices at 29 Broadway, New York, report that they are now erecting a rolling mill and will be pleased to have catalogues sent them relating to rolling mill machinery and furnaces. The Victor mill will be used particularly for the manufacture into sheets and rods their Victor Non-Corrosive Silver Metal. The company find it necessary to have a rolling mill of their own, as the demand for their metal is so large that other mills cannot handle their alloy to advantage.

The Elwood Ivins Tube Works, of Philadelphia, Pa., are sending to the trade a card showing the samples of the seamless tubing which they manufacture. Steel tubing as fine as a horse hair is manufactured. This is used for hypodermic syringes. A little larger size is used in the manufacture of watches. Among the new tubes recently brought out is that of pure nickel, never before made. This company also make brass and copper tubes as well as aluminum and other metals.

The New Jersey Aluminum Company, Newark, N. J., report that they are very busy at the present time, especially in their foundry, where they make automobile castings. In the fancy goods line some of their new articles are picture frames, bon-bon boxes, surgical instrument cases and watch charms. They have a process for oxidizing aluminum which resembles a gun metal finish. At present they are sending out samples of the work. The New Jersey company have a fine exhibit at the World's Fair.

The reports which have been spread about in regard to the newly formed Acme Wire Company, of New Haven, Conn., have been somewhat misleading. The company only intends to manufacture insulated copper wire and not bare, and has already commenced operations in the old Whitney Arms Company factory at New Haven. Although some of the officers are those of the Southern New England Telephone Company, the Acme Wire Company has no connection with this company.

The following directors of the Eagle Lock Company, of Terryville, Conn., were recently elected at the annual meeting: R. J. Plumb, of Terryville; N. B. Plumb, of Brooklyn, N. Y.; H. L. Balch, of New York City; F. P. Wilcox, of New York City; W. T. Woodruff, Thomaston, Conn.; O. B. Hough, Terryville, and A. E. Hart, of Hartford, Conn. The following officers were subsequently elected: President and treasurer, R. J. Plumb; secretary, R. J. Plumb.

The Hazardville Powder Company, of Hazardville, Conn., which is owned by the explosive manufacturers of E. I. Du Pont, De Nemours Company, of Wilmington, Del., has been closed and the manufacture of powder discontinued. Powder can be manufactured more cheaply at Wilmington. The Hazardville Company had its own brass foundry in which the powder tools were manufactured. This fact was not generally known among the makers of foundry supplies and appliances.

C. W. Moore, of Bridgeport, Conn., who recently embarked in the metal business, has found his present quarters on East Washington avenue too small and has leased a suitable building at the corner of Housatonic and East Washington avenue. He will also begin smelting and is already equipped with an Orbison furnace (the first in the East), Hill washing barrel, and Spool barrel. The latter is said to be an improvement over the former. Mr. Moore is now in the market for all kinds of copper bearing material.

Owing to the output of the Tacoma Smelting Company having increased to such an extent, the management has decided to erect an electrolytic copper refinery. Plans have been prepared for a building to cost about $250,000. The plant will have an output of 650 tons of refined copper per month. The erection of a copper rolling mill and wire drawing plant is also contemplated. The plant will be installed at Tacoma, Wash. D. O. Mills, of New York City, is interested in the enterprise, and W. R. Rust is manager.

The organization of the Bridgeport Foundry and Machine Company, of Bridgeport, Conn., has just been completed. Charles N. Choate is treasurer and general manager, and C. E. A. Thompson, president. Mr. Choate is treasurer and manager of the Deoxidized Bronze and Metal Company, of Bridgeport, and Mr. Thompson, vice-president. The new company is, therefore, affiliated with the Bridgeport Deoxidized Bronze and Metal Company and the business will be conducted in connection with it for the present. A machine shop will be installed, but no iron foundry at present, although one is contemplated for the future.

Metal Prices, September 7, 1904

METALS

	Price per lb.
TIN—Duty Free.	
Straits of Malacca	27.75
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	12.75
Electrolytic	12.65
Casting	12.50
SPELTER—Duty 1c. per lb.	
Western	5.10
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.25
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	7.00
Halletts	6.90
Other	6.50
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.58⅛
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask.	45.00

Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 6.50 per lb., open, 7.00 per lb.

Tobin Bronze—Rods, Unfinished, 19c.

Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots 16½c.

Phosphor Bronze, Ingots 15 to 18c.

Silicon-Copper, Ingots 34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	11.10c.	11.75c.
Copper Wire	11.00c.	11.75c.
Light Copper	9.50c.	10.50c.
Heavy Mach. Comp	9.50c.	10.75c.
Heavy Brass	7.25c.	8.00c.
Light Brass	5.50c.	6.00c.
No. 1 Yellow Brass Turnings	6.75c.	8.00c.
No. 1 Comp. Turnings	8.00c.	9.00c.
Heavy Lead	3.90c.	4.00c.
Zinc Scrap	3.50c.	4.00c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	18	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	20
	Longer than 96 ins.	18	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	18	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	19	20	22
	Longer than 120 ins	18	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	18	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	21	23	27
	Longer than 120 ins.	18	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	18	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	18	19	20	22	25	
	Longer than 120 ins	19	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	18	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	18	19	21	24	29	
	Longer than 120 ins.	19	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	19	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26		
	Longer than 120 ins.	21	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	22	23	25			
	Longer than 132 ins.	23	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, September 7, 1904

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb	23c.
Lighter than 10 oz	24c.
10 oz. and up to 12 oz	26c.
12 oz. and up to 14 oz. to square foot, per lb	29c.

Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order. Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc	$0.23	$0.27	$0.31
Above No. 10 to No. 16	.23½	.27½	.31½
Nos. 17 and 18	.24	.28	.32
" 19 and 20	.25	.29	.33
No. 21	.26	.30	.34
" 22	.27	.31	.35
" 23	.28	.32	.36
" 24	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 3½ in. O. D. Nos. 4 to 13 Stubs Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.
For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb	33	29	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

									Per lb
Plain Round Tube,	¾	in.	up	to	2	in.,	to No. 19,	inc.	$0 35
" " "	1⅛	"	"		2¼	"	" " 19,	"	36
" " "	1⅛	"	"		2⅝	"	" " 19,	"	38
" " "	1⅜	"	"		2⅝	"	" " 19,	"	41
" " "	1⅝	"	"		2⅝	"	" " 19,	"	48
" " "	1¾	"	"		2⅝	"	" " 19,	"	65
" " "	2	"	"		2¾	"	" " 19,	"	1 06
" " "	1⅞	"	"		3	"	" " 19,	"	1 50
Smaller than ⅛ inch									Special
2 inch to 3 inch, to No. 19, inclusive									38
3 inch									40
Over 3 inch to 3⅛ inch									45
Over 3⅛ inch									50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than... And Including...	55 in. 60 in.	50 in. 55 in.	45 in. 50 in.	40 in. 45 in.	36 in. 40 in.	30 in. 36 in.	24 in. 30 in.	20 in. 24 in.	18 in. 20 in.	16 in. 18 in.	14 in. 16 in.	6 in. 14 in.	3 in. 12 in. in coils.	Not wider than 6 in.	Polishing One Side.	Sat. Fin. without Lacquer. One Side.
No. 13 & heavier	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 14	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 15	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 16	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 17	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 18	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 19	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 20	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 21	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 22	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 23	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 24	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 25	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 26	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 27	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 28	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 29	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 30	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 31	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 32	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 33	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 34	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 35 & 36	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 37 & 38	50	50	48	48	47	47	47	44	44	44	44	42			2	6
" 39 & 40	50	50	48	48	47	47	47	44	44	44	44	42			2	6
.008" to .0015"	61	59	64	64	68	61	77	82	74	66	62	56	55	60	10	12
Less than .0015"													66		12	14

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds			10 per cent. off list.
1,000 to 2,000 "	10 per cent. and	2	" "
2,000 to 4,000 "	10 "	3	" "
4,000 pounds and over	10 "	5	" "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.	Outside Diameter in Inches.
1-4	.....	.....	.....	10	9	8	7	1-4
5-16	.....	.....	.....	11	9	8	7	5-16
3-8	.....	.....	.....	12	9	8	7	3-8
1-2	.....	.....	17	14	11	9	8	 1-2
5-8	.....	.....	21	16	13	12	.....	5-8
3-4	.....	.....	25	19	16	14	.....	3-4
7-8	.....	.....	28	22	18	16	.....	7-8
1	.....	.....	30	25	21	19	.....	.....1 00
1 1-4	.....	.....	36	30	25	.....	.....	.....1 14
1 1-2	.....	52	43	35	28	.....	.....	.....1 1-2
1 3-4	.....	60	50	41	33	.....	.....	..... 1 34
2	84	68	58	47	37	.....	.....	.....2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B. & S. Gauge.	0000 to No. 10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

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